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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/990,181	11/21/2001	Igor Gonda	AERX-088	1229

24353 7590 10/03/2003

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EXAMINER	
SCHNIZER, RICHARD A	
ART UNIT	PAPER NUMBER
1635	

DATE MAILED: 10/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/990,181	GONDA ET AL.	
	Examin r	Art Unit	
	Richard Schnizer, Ph. D	1635	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on *21 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 4/1/02
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8/1/03
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information disclosure statements were received and entered on 4/1/02 and 8/1/03.

Claims 1-28 are pending and under consideration in this Office Action.

Claim Objections

Claim 20 is objected to because the phrase "wherein said the aerosol" is ungrammatical. Deletion of "the" is suggested.

Claim 28 is objected to because the phrase "the aerosoling in carried out" is ungrammatical. It is suggested that the word "in" should be replaced with the word "is". It is also suggested that the word "aerosoling" should be replaced with the word "aerosolizing".

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 5, 8, 10, 27, and 28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrase "encodes a biologically active amino acid sequence" renders claim 5 indefinite because amino acid sequences have no biological activity per se, polypeptides do. For example, one of skill in the art might consider a polypeptide of a

given amino acid sequence to be biologically active if it is properly folded such that it has a certain enzymatic activity, whereas a polypeptide of the same amino acid sequence could be considered inactive if it is improperly folded, i.e. irreversibly denatured. Thus the amino acid sequence does not have a biological activity per se, rather a polypeptide comprising the sequence may have the activity.

Claim 8 is indefinite because it is unclear what are the metes and bounds of "high molecular weight polynucleotide". This phrase is defined at paragraph 43 of the specification as "a polynucleotide molecule that comprises at least one coding sequence that can be transcribed when the polynucleotide is introduced into a host cell." However, the phrase is also defined in this paragraph as "generally understood to mean polynucleotides that contain such regulatory elements" wherein recited regulatory elements include "cis-acting regulatory elements, such as enhancer sequences, operator sequences and the like", and "a ribosome binding site, an initiation codon and transcription termination and polyadenylation signals." It is unclear what is embraced by "enhancer sequences, operator sequences and the like". See MPEP § 2173.05(d) states that "the phrase "or the like" renders claim(s) indefinite because the claim(s) include(s) elements not actually disclosed (those encompassed by "or the like"), thereby rendering the scope of the claim(s) unascertainable." Further, it is unclear from the phrase "generally understood to mean polynucleotides that contain such regulatory elements" if the high molecular weight polynucleotides must have only one, or all of the characteristics listed in paragraph 43.

Claim 10 is incomprehensible. Specifically, the phrase "with an efficiency of 200% more as compared to transfer human cells about the cationic aminoglycoside" lacks meaning. For the purpose of examination, this claim has been interpreted as "with an efficiency of 200% or more as compared to that obtained in the absence of the cationic aminoglycoside."

Claims 27 and 28 are incomplete because, while the preamble requires that treatment must be effected, it is unclear what constitutes said treatment because the claims do not clearly indicate at what step treatment occurs, and so it is not clear that the method steps recite any treatment at all. For example, it is unclear if the treatment consists merely of expressing a polypeptide, or whether the treatment embraces obtaining a therapeutic effect. It is not clear what is the endpoint of the method.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5, 8, 10, 11, 13-18, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Douthart et al (US Patent 4,400,375, issued 8/23/83), as evidenced by Sugiura et al (Eur. J. Biochem. (1977) 73(1): 179-184).

Douthart teaches complexes of double stranded RNA and the cationic aminoglycoside tobramycin. See abstract. Douthart also discloses complexes of

dsRNA with neomycin and streptomycin. See column 1, lines 38-45. The compositions of Douthart may comprise water and have a pH of 6.8 to 7.2. See column 3, lines 32-40. The RNA is considered to encode biologically active amino acid sequences, and to be a "high molecular weight polynucleotide" as defined by the specification at paragraph 43, because it can be the genomic RNA of an RNA virus (Penicillum chrysogenum virus). See column 2, lines 44-50. Evidence that this RNA is a "high molecular weight polynucleotide" as defined at paragraph 43 comes from Sugiura (1977) who teaches that it can be transcribed into mRNA by a host cell polymerase. See abstract. The composition is formulated to be delivered by any conventional route, including parenteral, intranasal, and intraperitoneal. See column 4, lines 3-33. Absent evidence to the contrary, such formulations can also be delivered by any of the means recited in claim 11. The composition may be incorporated into liposomes. See column 4, lines 34-37. Douthart also teaches methods of delivering the complexes to peritoneal macrophages ex vivo (in vitro). See paragraph bridging columns 7 and 8. Douthart also teaches delivery to cells in vivo. See column 8, lines 27-68.

Claim 10 is included in the rejection because, although Douthart does not measure transfection efficiency, the recited improvement of transfection efficiency is considered to be inherent in the structure of the claimed composition. Because there is no apparent difference between the structure of the complexes of Douthart and the instantly claimed compositions, the compositions of Douthart are considered to have the same functional characteristics of the claimed compositions. Similarly, claims 15 and

18 are included because the required reduction in physical volume is considered to be inherent in the compositions. Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an Applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. See In re Ludtke, supra. Whether the rejection is based on "inherency" under 35 USC 102, on "prima facie obviousness" under 35 USC 103, jointly or alternatively, the burden of proof is the same, and its fairness is evidenced by the PTO's inability to manufacture products or to obtain and compare prior art products. In re Best, Bolton, and Shaw, 195 USPQ 430, 433 (CCPA 1977) citing In re Brown, 59 CCPA 1036, 459 F.2d 531, 173 USPQ 685 (1972).

Finally, it is noted that Douthart discloses complexes of dsRNA with a variety of polycations including polylysine, DEAE-dextran, protamine, histone, and colistin, as well as three different cationic aminoglycosides (tobramycin, neomycin, and streptomycin). See column 1, lines 38-45. For this reason, it is considered obvious to complex dsRNA with any polycation, including the cationic aminoglycosides recited in claims 4 and 22.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 16, 19, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heyes et al (Nature (1974) 247 (5441): 485-487 in view of by Douthart et al (US Patent 4,400,375, issued 8/23/83), and Douthart et al (J. Interferon Research (1982) 2(4): 493-499).

Heyes teaches a method of delivering by inhalation to lungs of a mouse an aerosol comprising mycophage dsRNA for chemotherapeutic treatment of lung tumors.

Heyes does not teach a composition comprising a cationic aminoglycoside. Heyes is also silent as to whether the dsRNA is allowed to remain in contact for a period of time such that it enters the cell. However, because the dsRNA is not removed from the lungs, this claim limitation is considered to be met. Further, it is clear from Douthart (1982) that the antitumor effect of mycophage dsRNA is due to induction of interferon expression, and that interferon induction by dsRNA involves cellular uptake of the dsRNA (see e.g. abstract and page 493, lines 3 and 4 pf paragraph bridging pages 493 and 494). So the fact that the method of Heyes results in an antitumor response is evidence that cellular uptake of dsRNA occurs.

Douthart (1983) teaches that viral dsRNA is an anti-tumor, interferon-inducing drug, that the resistance to nuclease degradation of dsRNA can be increased by complexing the dsRNA with tobramycin, and that the anti-tumor activity of dsRNA complexed with tobramycin is enhanced relative to naked dsRNA. See abstract, column 1, lines 7-12, column 2, lines 3-15.

It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the dsRNA/tobramycin complexes of Douthart for uncomplexed

dsRNA in the method of Heyes. One would have bee motivated to do so because Douthart teaches that the antitumor activity of the complexed dsRNA is enhanced.

Claim 19 is included in this rejection because the mycoviral dsRNA exemplified by each of the references is a viral genomic RNA and, absent evidence to the contrary, it encodes biologically active amino acid sequences for viral proteins.

Thus the invention as a whole was prima facie obvious.

Claims 1, 6, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heyes (1974), Douthart (1983) and Douthart (1982) as applied to claims 16, 19 and 26 above, and further in view of Gonda et al (US Patent 6,070,575, issued 6/6/00).

Heyes, Douthart (1983) and Douthart (1982) can be combined to teach an aerosol composition comprising dsRNA complexed with the cationic aminoglycoside tobramycin, and a method of delivering it topically by inhalation to the lung. Heyes teaches that the aerosol particles are less than 8 microns in diameter with a substantial portion being about 1 micron, but does not explicitly state what is the aerodynamic diameter of the particles. However, Heyes does teach the that the particles are of an appropriate diameter to reach the alveoli of the lung. See page 498, column 1, lines 1-4.

The combined references do not explicitly teach aerosol particles having an aerodynamic diameter in a range of from about 0.5 microns to 12 microns recited in claim 6, or the narrower range of 2-6 microns recited in claim 9.

Gonda teaches that "aerosolized particles for respiratory delivery must have a diameter of 12 microns or less, and that "topical lung treatment can be accomplished with particles having a diameter in the range of 0.01 to 12.0 microns." See column 1, lines 12-14 and 17-19.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use aerosol particles having an aerodynamic diameter in the range of 0.35 to 12 microns. One would have been motivated to do so because Gonda teaches that this range of particle sizes is useful for topical delivery to the lung. With regard to the narrower range of 2-6 microns recited in claim 9, MPEP 2144.05 states that "[i]n the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191USPQ 90 (CCPA 1976); In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed.Cir. 1990).

Thus the invention as a whole was prima facie obvious.

Claims 1, 12, 16, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gautam et al (Mol. Ther. (2000) 2(4): 318-323) in view of Douthart (1983), Douthart (1982), and Dubensky et al (US Patent 5,789,245, issued 8/4/1999).

Gautam teaches a method of inhibiting experimental lung metastases by aerosol delivery to a mouse's lungs of a complex comprising a nucleic acid encoding p53 bound to the polycation polyethyleneimine (PEI). See abstract.

Gautam does not teach a composition comprising a nucleic acid and a cationic aminoglycoside; or the inclusion of targeting moieties, nuclear localization peptides, or endosomolytic peptides.

Douthart (1983) discloses complexes of dsRNA with a variety of polycations including polylysine, DEAE-dextran, protamine, histone, and colistin, as well as three different cationic aminoglycosides (tobramycin, neomycin, and streptomycin). See column 1, lines 38-45.

Douthart (1982) teaches that complexes between dsRNA and polycations give greater induction of interferons than naked dsRNA, and indicates that this is due to increased cellular uptake of the complexed dsRNA. See abstract and page 493, lines 3 and 4 pf paragraph bridging pages 493 and 494).

Both Douthart (1982 and Douthart (1983) teach that administration to cells of cationic aminoglycoside:dsRNA complexes results in increased interferon production. Given these teachings, one of ordinary skill in the art would deduce that cationic aminoglycosides improve interferon production by improving cellular uptake of dsRNA.

Dubensky is relied upon in this rejection for a discussion of the theory behind using polycations to facilitate nucleic acid delivery to cells. See column 79, lines 34-45, in which Dubensky indicates that polycations function to neutralize negative charges on a nucleic acid molecule and condense it into a compact form, resulting in increased transfection efficiency. One of ordinary skill in the art appreciates that eukaryotic cells generally bear a negative surface charge, so neutralization of the negative charges on nucleic acids is thought to minimize charge repulsion between nucleic acids and target

cells. Dubensky also teaches that transfection complexes may be modified to include targeting moieties, nuclear localization peptides, or endosomolytic peptides. See column 79, lines 45-57.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Gautam by substituting a cationic aminoglycoside such as tobramycin for PEI, and to deliver nucleic acid/cationic aminoglycoside complexes rather than nucleic acid/PEI complexes. In light of the cited teachings above, one of ordinary skill in the art would consider PEI and cationic aminoglycosides to be art recognized equivalents because they both function to bind nucleic acids and facilitate uptake into cells. MPEP 2144.06 indicates that when it is recognized in the art that elements of an invention can be substituted, one for the other, while retaining essential function, such elements are art-recognized equivalents. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. In re Fout, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). Furthermore, MPEP 2144.07 indicates that the selection of a known material based on its suitability for its intended use supports the determination of prima facie obviousness. See also Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

It would have been similarly obvious to modify the method of Gautam by including targeting moieties, nuclear localization peptides, or endosomolytic peptides in the delivery composition. One would have been motivated to do so because Dubensky

teaches that these modifications facilitate the transfection process. See column 79, lines 45-57.

Thus the invention as a whole was prima facie obvious.

Claims 21-24, 27, and 28 are rejected 35 U.S.C. 103(a) as being unpatentable over Gautam (2000), Douthart (1983), Douthart (1982), and Dubensky (1999) as applied to claims 1, 12, 16, 19, and 20 above, and further in view of Gonda et al (US Patent 6,070,575, issued 6/6/00).

The teachings of Gautam (2000), Douthart (1983), Douthart (1982), and Dubensky (1999), are summarized above and can be combined to render obvious a method of delivering by aerosol to a patient's lungs a complex of a cationic aminoglycoside and a nucleic acid expression vector encoding p53. The method could be used to inhibit the metastasis of an experimental lung tumor. Pertinent to claims 23 and 24, it is noted that Douthart (1983) teaches that the cationic aminoglycoside:nucleic acid complex can be delivered in a liposome.

The combined references are silent as to the aerodynamic diameter of the particles in the aerosol.

Gonda teaches that "aerosolized particles for respiratory delivery must have a diameter of 12 microns or less, and that "topical lung treatment can be accomplished with particles having a diameter in the range of 0.01 to 12.0 microns." See column 1, lines 12-14 and 17-19. Gonda also teaches a convenient process and apparatus for

creating such aerosols, that requires forcing a composition to be aerosolized through a porous membrane. See e.g. claims 14 and 15.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use aerosol particles having an aerodynamic diameter in the range of 0.5 to 12 microns or in the range of 2-6 microns. One would have been motivated to do so because Gonda teaches that the range of 0.01 to 12.0 microns is useful for topical delivery to the lung. MPEP 2144.05 states that "[i]n the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191USPQ 90 (CCPA 1976); In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed.Cir. 1990). Because Douthart (1983) teaches that the cationic aminoglycoside:nucleic acid complex can be delivered in a liposome, absent evidence to the contrary, it would have been obvious to form an aerosol comprising such complexes, and to use it in the method of Gautam.

It would have been similarly obvious to use the apparatus of Gonda to generate the aerosol because it is more efficient than devices that adjust the size of aerosol particles after aerosol generation. See paragraph bridging columns 2 and 3 of Gonda.

Thus the invention as a whole was prima facie obvious.

Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boussif et al (Proc. Nat. Acad. Sci. USA (1995) 97: 7297-7301) in view of Douthart et al (US Patent 4,400,375, issued 8/23/83), and Douthart et al (J. Interferon Research (1982) 2(4): 493-499), and Dubensky et al (US Patent 5,789,245, issued 8/4/1999).

Boussif that complexing oligonucleotides to polycations such as polyethyleneimine (PEI) and other polyamines facilitates their delivery to cells. See abstract.

Douthart (1983) discloses complexes of dsRNA with a variety of polycations including polylysine, DEAE-dextran, protamine, histone, and colistin, as well as three different cationic aminoglycosides (tobramycin, neomycin, and streptomycin). See column 1, lines 38-45.

Douthart (1982) teaches that complexes between dsRNA and polycations give greater induction of interferons than naked dsRNA, and indicates that this is due to increased cellular uptake of the complexed dsRNA. See abstract and page 493, lines 3 and 4 pf paragraph bridging pages 493 and 494).

Both Douthart (1982 and Douthart (1983) teach that administration to cells of cationic aminoglycoside:dsRNA complexes results in increased interferon production. Given these teachings, one of ordinary skill in the art would deduce that cationic aminoglycosides improve interferon production by improving cellular uptake of dsRNA.

Dubensky is relied upon in this rejection for a discussion of the theory behind using polycations to facilitate nucleic acid delivery to cells. See column 79, lines 34-45, in which Dubensky indicates that polycations function to neutralize negative charges on a nucleic acid molecule and condense it into a compact form, resulting in increased transfection efficiency. One of ordinary skill in the art appreciates that eukaryotic cells generally bear a negative surface charge, so neutralization of the negative charges on

nucleic acids is thought to minimize charge repulsion between nucleic acids and target cells.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the delivery method of Boussif by substituting a cationic aminoglycoside such as tobramycin for PEI, and to deliver antisense oligonucleotide/cationic aminoglycoside complexes rather than antisense oligonucleotide/PEI complexes. In light of the cited teachings above, one of ordinary skill in the art would consider PEI and cationic aminoglycosides to be art recognized equivalents because they both function to bind nucleic acids and facilitate uptake into cells. MPEP 2144.06 indicates that when it is recognized in the art that elements of an invention can be substituted, one for the other, while retaining essential function, such elements are art-recognized equivalents. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. In re Fout, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). Furthermore, MPEP 2144.07 indicates that the selection of a known material based on its suitability for its intended use supports the determination of prima facie obviousness. See also Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

Thus the invention as a whole was prima facie obvious.

Conclusion

No claim is allowed.

Any inquiry concerning this communication or earlier communications from the examiner(s) should be directed to Richard Schnizer, whose telephone number is 703-306-5441. The examiner can normally be reached Monday through Friday between the hours of 6:20 AM and 3:50 PM. The examiner is off on alternate Fridays, but is sometimes in the office anyway.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Leguyader, can be reached at 703-308-0447. The FAX numbers for art unit 1632 are 703-308-4242, and 703-305-3014. Additionally correspondence can be transmitted to the following RIGHTFAX numbers: 703-872-9306 for correspondence before final rejection, and 703-872-9307 for correspondence after final rejection.

Inquiries of a general nature or relating to the status of the application should be directed to the Patent Analyst Trina Turner whose telephone number is 703-305-3413.

Richard Schnizer, Ph.D.

DAVE T. NGUYEN
PRIMARY EXAMINER